A.T. Kearney | Carnegie Mellon

Beyond Big: The Analytically Powered Organization

30–31 January 2014

Carnegie Mellon University | Pittsburgh, Pennsylvania

Big data continues to grow. How big has it gotten? Consider a few facts:

- More than 2.5 quintillion bytes of data are created every day through a range of activities including social media posts, purchase transaction records, cell phone GPS signals, supply chain and logistics data, and digital videos, pictures, and audio recordings.
- Individuals generate more than 70 percent of all data; enterprises store and manage 80 percent of this data.[1]
- The average business expects to spend $8 million on big data-related initiatives this year.[2]
- Hiring growth is part of this spending. It is estimated that for every IT job created in the United States to support big data efforts, three big data-related jobs outside of IT are being generated. This equals literally hundreds of thousands, potentially millions, of new jobs.[3]
- Global spending on big data is growing at an average annual rate of nearly 30 percent and is expected to reach $114 billion in 2018.[4]

While this massive wave of data promises to transform both top and bottom lines, few organizations have been able to operationalize and monetize this promise for their enterprise. Successfully managing big data and analytics is not about having the right technology, operating model, or people, but about tying these three vital aspects together to create a culture anchored by differentiated analytics.

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This January, A.T. Kearney and Carnegie Mellon University jointly hosted an executive roundtable to discuss how this is being done in a variety of industries. Held at Carnegie Mellon University, the Beyond Big roundtable explored how data's influence is felt in spheres as diverse as politics, sports, insurance, and shopping. The forum brought together thought leaders and practitioners in data to share their experiences and perspectives on the opportunities and challenges of tapping into the promise that analytics holds for helping to bring about game-changing outcomes.

This paper reflects the content delivered by the speakers and participants during the roundtable, along with responses to questions that arose in the course of discussion.

[1] CSC Insights, "Big Data Universe Beginning to Explode," www.csc.com/insights/flxwd/78931-big_data_growth_just_beginning_to_explode

[2] IDG Enterprise, "2014 IDG Enterprise Big Data Research Study," www.idgenterprise.com/report/big-data-2

[3] Gartner, Inc., "Gartner Says Big Data Creates Big Jobs: 4.4 Million IT Jobs Globally to Support Big Data By 2015," www.gartner.com/newsroom/id/2207915

[4] ABI Research, "Big Data Spending to Reach $114 Billion in 2018; Look for Machine Learning to Drive Analytics," www.abiresearch.com/press/big-data-spending-to-reach-114-billion-in-2018-loo

A.T. Kearney-Carnegie Mellon LEAP Study

Khalid Khan, partner, A.T. Kearney

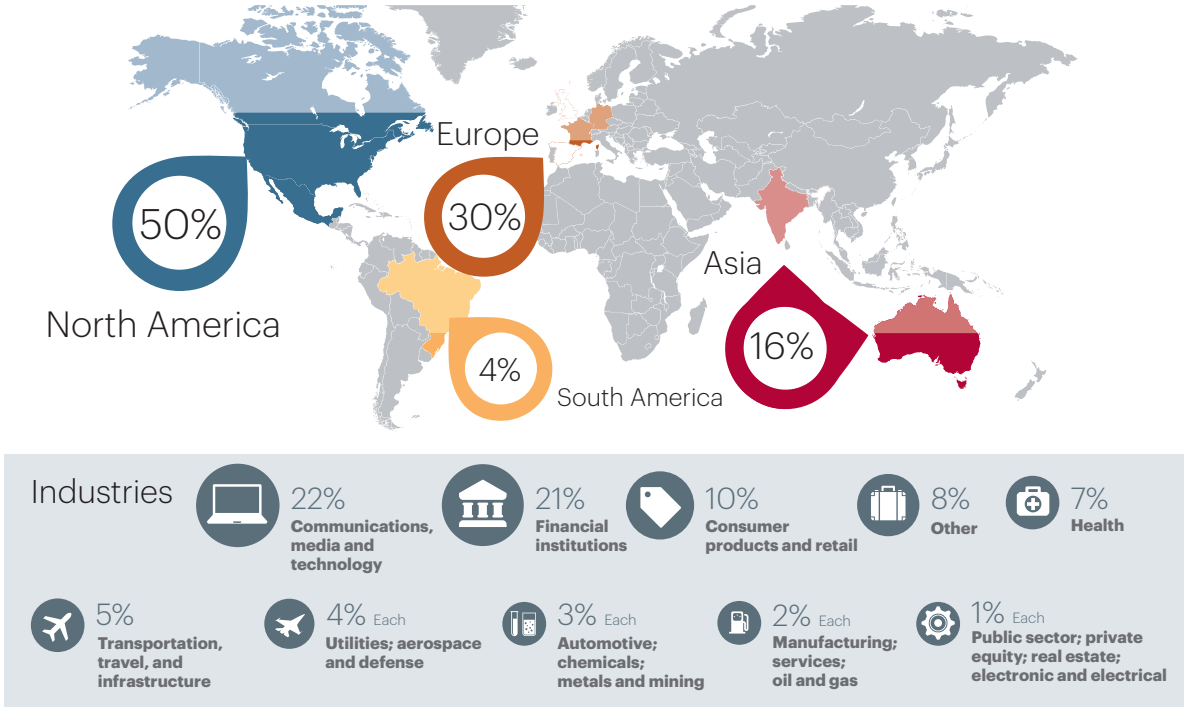
Christian Hagen, partner, A.T. Kearney

The growth, range, and speed of data hold tremendous promise for transforming management models and the ways in which organizations make decisions. But doing so will require mobilizing the organization to tap into the potential value that data offers. A new breed of businessperson proficient in technology, core critical thinking, and analytics is needed, as are people who can pull these skills together with the right domain expertise and knowledge of business strategy. Technology will underpin the transformation; it is a necessary element, but not the differentiator.[5]

A.T. Kearney and Carnegie Mellon University recently surveyed 430 companies around the world, representing a wide range of geographies and industries, for the inaugural Leadership Excellence in Analytic Practices (LEAP) study (see figure 1). Based on the maturity of respondents' analytic competency and their ability to employ analytics to impact their business results, we have clustered them into four populations: leaders (10 percent), explorers (32 percent), followers (38 percent), and laggards (20 percent). Only the leaders have attained the level of competency needed to impact business results significantly. While these leaders are found in every industry, those industries with many consumer touch points are generally more mature in their analytics approaches, as they tend to use information in innovative ways and take innovative approaches to product and service development.

Figure 1

LEAP study participant demographics



Source: Leadership Excellence in Analytic Practices (LEAP) study, 2014

[5] For more information, see Big Data and the Creative Destruction of Today's Business Models, at www.atkearney.com.

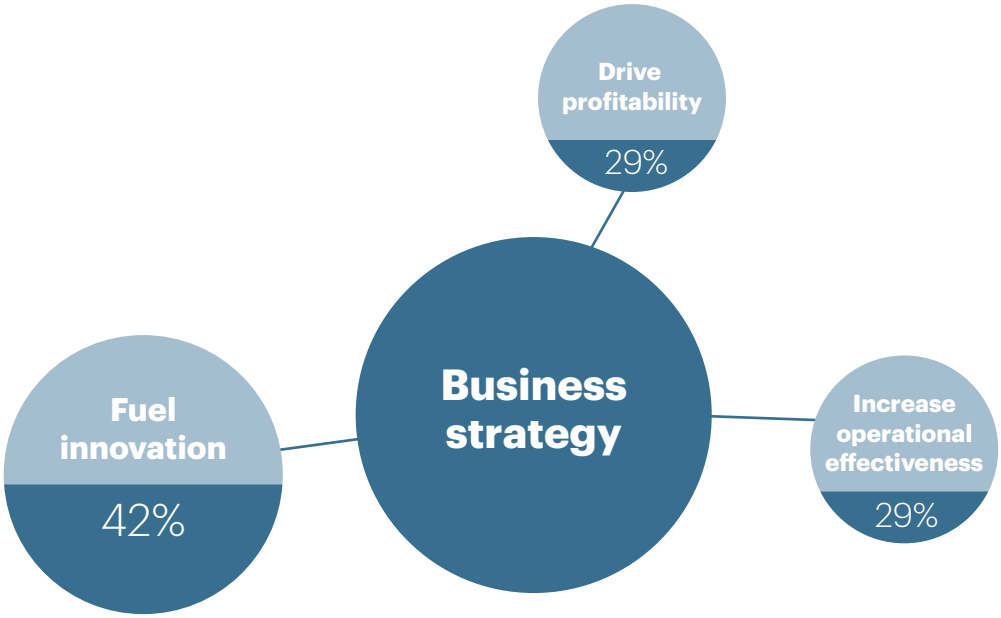
In the course of the LEAP study team's analysis, five themes and associated leadership practices have emerged:

Christian Hagen, partner, A.T. Kearney

- **Enterprise value.** Leaders use predictive analytics to fuel innovation and growth.
- **Sponsorship.** Leaders enroll executive-level "champion-practitioners" to carve out analytics mindshare.
- **Mobilization.** Leaders use pilots and rapid proof-of-concept deployment to create traction with businesses through faster value capture.
- **Technology enablement.** Leaders take a balanced approach to building their advanced analytics technology footprint.
- **Talent empowerment.** Leaders co-create and collaborate across data and decision-making silos to drive a culture of analytics-based decisions.

Leaders have developed the capabilities needed to succeed in their analytic efforts. While laggards remain focused on applying data for reporting, the leaders are springing forward with analytics to evaluate risks and tradeoffs, understand cost and revenue drivers, and predict trends to help drive business performance and innovation. Leaders are pushing the innovation agenda forward through analytics to create value (see figure 2). Executives have always required a forward view of their business; analytics provides them the vehicle for a more comprehensive and informed view of what could impact their business.

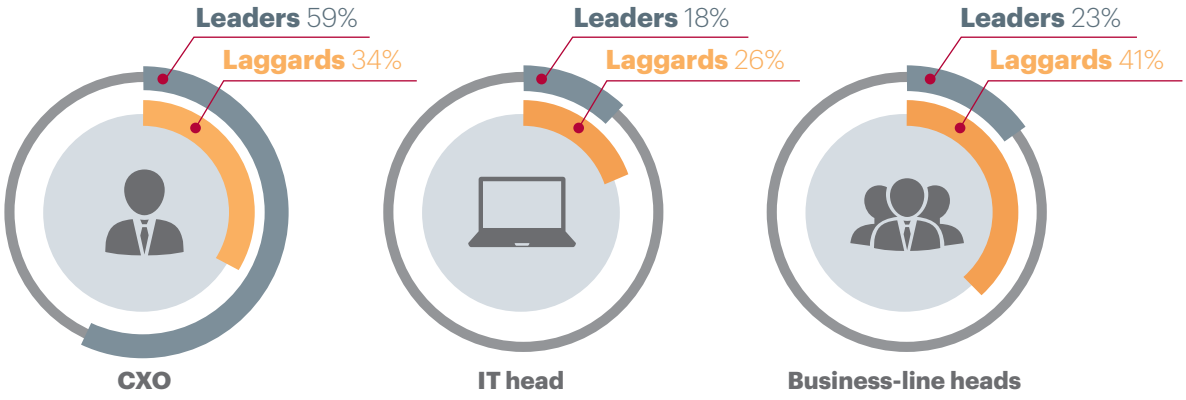
Figure 2
How analytics impacts business strategy



Source: Leadership Excellence in Analytic Practices (LEAP) study, 2014

Executive sponsorship is vital to developing the enterprise's enthusiasm for analytics. As seen in figure 3, the leaders are finding champions at the very top of their organizations—from the chief operating officer (COO), chief financial officer (CFO), or chief marketing officer (CMO)—while laggards more often find their analytics leaders in the IT leadership position or their business lines. Champions typically create demand for these services within their organizations in addition to promoting them elsewhere in the business. We are also seeing the emergence of a new C-level executive—chief data scientists or chief analytics officers (CAOs)—responsible for bringing analytic innovation to the broader enterprise. This role requires expertise from several domains to be woven together, including business strategy, data management, data science, and technology.

Figure 3
Analytics champions by position



Source: Leadership Excellence in Analytic Practices (LEAP) study, 2014

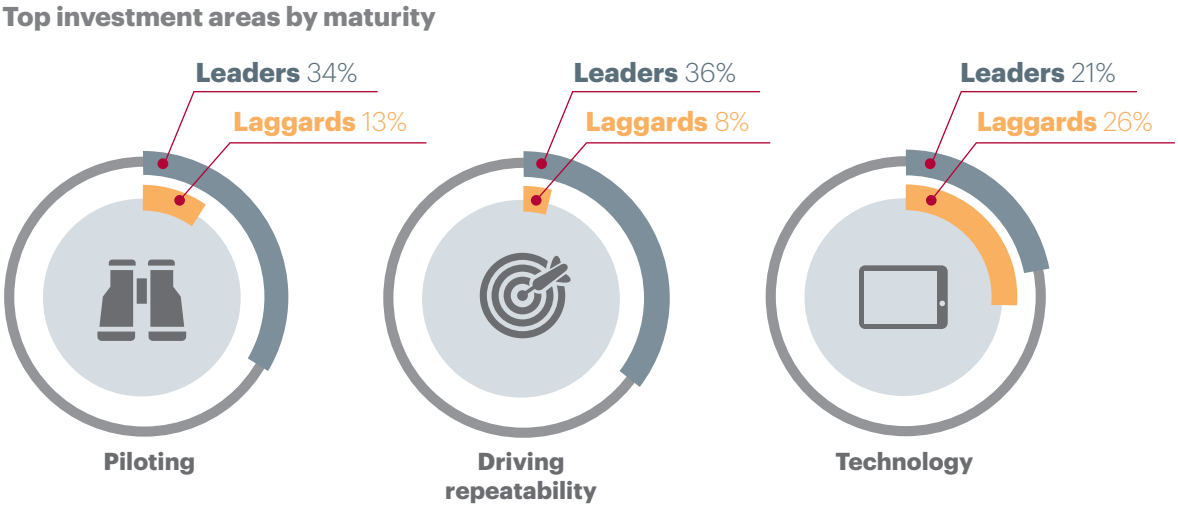
Although IT can enable success, it cannot drive it—this is as true in analytics work as it is in procurement, supply chain, or any other business function. Leaders are focused on piloting analytics efforts to secure buy-in and driving toward the development of repeatable solutions and processes, as shown in figure 4 on page 5. Leading companies emphasize co-creation and collaboration among stakeholders to maximize results. For example, a single function cannot effectively reduce product complexity; rather, it needs to be addressed at the enterprise level and requires advanced data analytics to tackle in a systematic and holistic manner.

Big data and advanced analytics comprise an increasingly large part of total technology spending at most companies. In building out their big data and analytics technology footprints, leaders are upgrading their existing stack through models that provides the flexibility to support rapid experimentation and innovation. At present, the complex and diffuse technology ecosystem around analytics provides a wide range of options that can pose a challenge when trying to make large capital IT investments (see figure 5 on page 5). In just a few short years, consolidation is likely to change this landscape significantly, leaving fewer, stronger service providers to partner with.

The big question almost every company faces is how to obtain the right talent to become an analytics leader and build a culture of sustained excellence. IT can be purchased, and data can be cleansed, expanded, and bought. Leaders emphasize the need to build an analytics-focused culture to encourage adoption across the enterprise by fostering cross-functional collaboration and increasing confidence by building from pilots to demonstrate the value of analytics and

Figure 4

Leaders are piloting analytics efforts and developing repeatable solutions

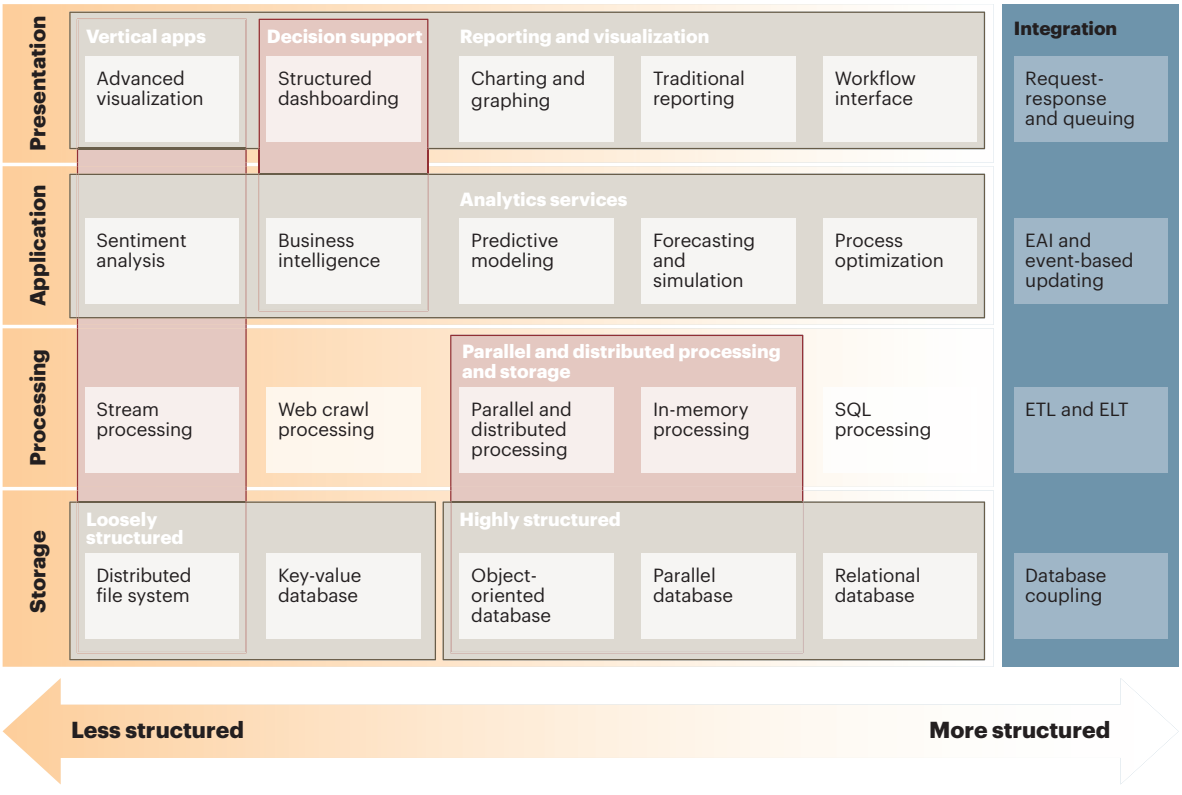


Source: Leadership Excellence in Analytic Practices (LEAP) study, 2014

Figure 5

Big data architecture

Illustrative



Notes: EAI is enterprise application integration. SQL is structured query language. ETL is extract, transform, and load. ELT is extract, load, and transform.

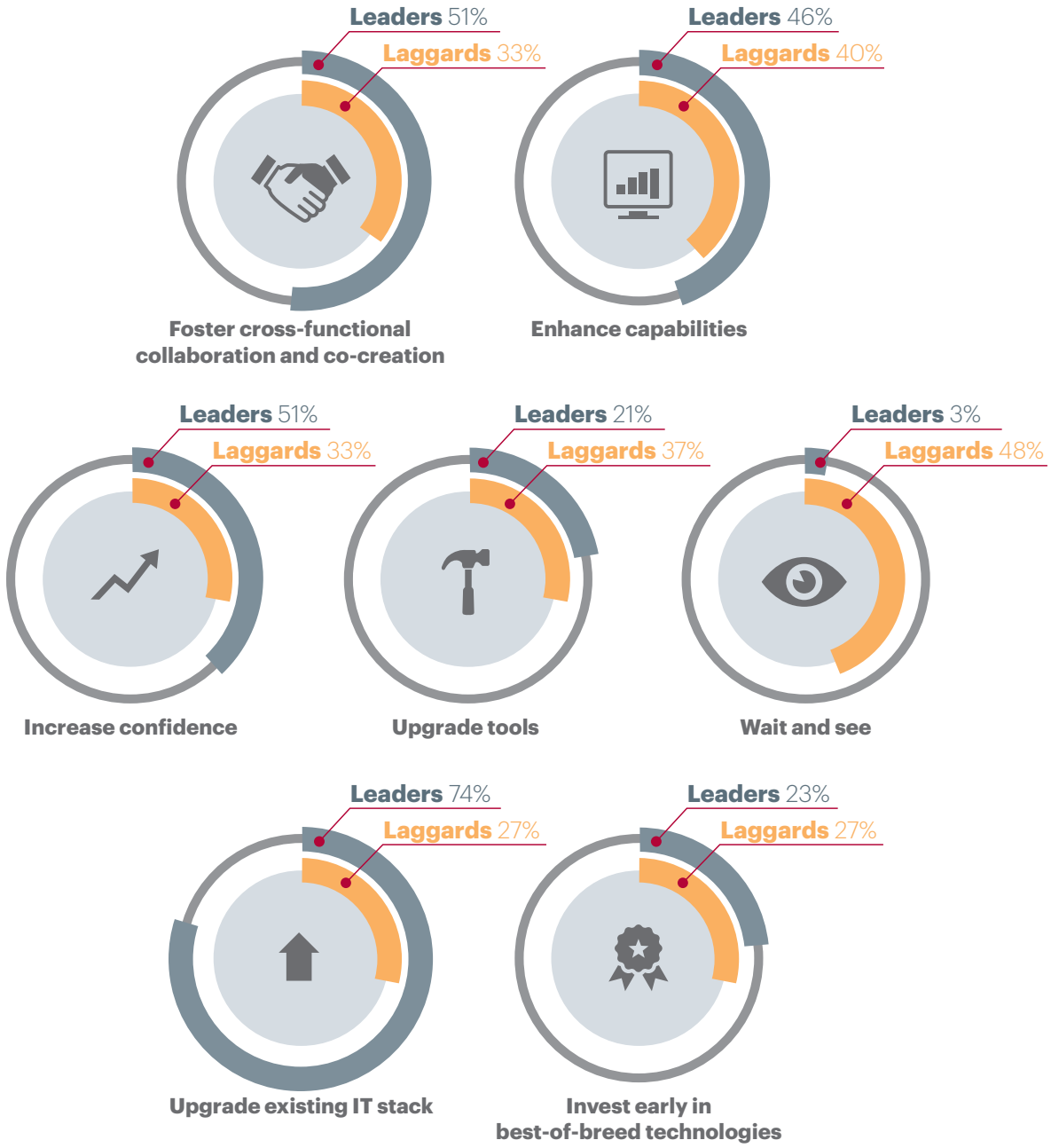
Source: A.T. Kearney analysis

enhancing capabilities. Figure 6 shows leaders' bias toward collaboration and laggards' overemphasis on technology tools. Leaders are demonstrating shared value for the enterprise and creating analytics-driven communities.

Analytics brings change; executives accustomed to "going with their gut" are likely to resist this change, as they are unaccustomed to working with the probabilities generated from a predictive model. But this change is inevitable; only 4 percent of study participants dismiss analytics as a "passing fad." Assembling the right team profile is a significant challenge even

Figure 6

Leaders and laggards take distinctly different approaches to building an analytics culture



Source: Leadership Excellence in Analytic Practices (LEAP) study, 2014

for the leaders in this space. Cultivating an analytics team requires piecing together a cross-functional skill set that includes expertise in business strategy, data science, and technology.

The CAO role will emerge at many companies in coming years; 6 percent of LEAP participants already have such an individual in place. Many questions remain about where these leaders will come from, to whom they will report, and how their role will differ from other functional leaders, but certainty is that analytics will increasingly be a permanent part of "business as usual."

Session I

Murli Buluswar, senior vice president and chief science officer, AIG

Key points

- CEO sponsorship is a powerful enabler for undertaking the transformation to an analytics-based company.
- Introducing analytics capabilities on a no-cost basis opens the organization to this new approach.
- When recruiting talent, the ability to shape problems is more important than industry knowledge.
- Science team members can be slotted into business-focused teams to help drive success.

In 2011, AIG's $35 billion property and casualty insurance division sought to break out of the industry's "data rich, knowledge poor" state by introducing a chief science officer (CSO). This individual would lead a new team focused on challenging conventional wisdom by asking thoughtful questions and then addressing them through scientific, data-driven means. Because AIG pays out $100 million in claims each day, a shift of one or two basis points meant significant benefits. Extracting value from the extensive risk-related data that AIG owned, however, required game-changing science.

Buluswar joined AIG in January 2012 with a mandate from the new head of the firm's property and casualty division to build the new data science division from scratch. It started by scoping and staffing the team and determining which questions to address and how to integrate the new function into a mature organization. To help build a culture of analytics, the science team's services would be offered to the business at no charge for the first two years to provide a low-risk, no-cost way to begin tapping into these capabilities.

The AIG science team started with five members and now numbers more than 100. As talent was brought on board—almost exclusively from a variety of industries—the abilities to ask insightful questions and shape problems through a multidisciplinary, functional lens were viewed as most important. Team members fall into three broad sets of skills: consultative skills, deep data expertise, and focus on implementation. The team works on efforts that cover short-, medium-, and long-term time horizons in parallel. We apply the analytics skills to sales and marketing, underwriting, and claims across product lines and geographies.

The AIG science team has found it easier to engage the business as its successes have built and the rules of engagement have been clarified. In 2013, its work on core and strategic problems brought a meaningful return on investment. Its initial successes clearly demonstrate the value that analytics can bring.

From left to right: **Steven Hillion**, Alpine Data Labs; **Marvin Thelmer**, Amazon; **Anuj Dhanda**, Giant Eagle; **Robert J. Rosati**, CenterLight Healthcare; **Brent Dykes**, Adobe Systems

Session II

Rayid Ghani, research director at the Computation Institute at the University of Chicago and former chief scientist of the 2012 Obama campaign

Key points

- Analytics can be applied to segmentation efforts that identify potential supporters or customers.
- Messaging can target supports or customers to make them advocates for a candidate or brand.
- The data science team cannot work in a vacuum; knowledge of and engagement with the business and the field is crucial.
- Experimentation can yield powerful results.
- Operationalizing insights in the field and with the resources is job number one. Convincing everyone that this is right is the only way they will drive change and messages.

Some have opined that President Barack Obama's successful reelection in 2012 was driven by technology and analytics.[6] The campaign employed social media extensively to raise money and engage with voters. It also took advantage of mobile technologies to fundraise through a "quick-donate" program that stored payment information to allow supporters to make multiple donations through a single click on their mobile phone, tablet, or computer—an effort that yielded 1.5 million donations totaling $115 million. For marketers, the bigger lesson from the reelection campaign was the way data was used to find and motivate supporters to convince their own contacts to vote for Obama through tailored messaging. In other words, the campaign built the Obama brand through digital word of mouth.

[6] "Corporations Want Obama's Winning Formula," *Bloomberg Businessweek*, 21 November 2012

Ghani, the campaign's chief scientist, disputes the notion that technological savvy and data mastery alone were enough to win the campaign.[7] Ghani, who started working with the campaign in spring 2011, says that the most important use of data was to help determine which voters would be most persuadable—to support Obama, and in turn take the time to vote for him—and to then shift resources to attracting these prospective voters.

The Beyond Big executive roundtable explored how data's influence is felt in spheres as diverse as politics, sports, insurance, and shopping.

Ghani's team, which was set up as an analytics-focused consulting organization, quickly grew from 20 to 700 members. The team featured technical members who developed analytic models and analysts who worked with other teams to set up the questions that drove these models. Data science team members had to learn the business of the different teams they supported—such as fund-raising and media—before they could develop questions. The more embedded the analysts became in a team, the more effective the results they achieved. More often than not, the data science team members had to push their way onto projects with the support of their sponsors high up in the campaign. Quick wins were invaluable in building credibility as the team tested, piloted, and then integrated analytics into the campaign.

To win the election, the campaign had to register new voters who seemed likely to vote for the candidate, persuade undecided voters, and get existing supporters to actually vote. Analytic efforts were crucial in persuading voters in all three of these camps. The team employed several terabytes of individuals' data, including which elections they voted in, donation histories, and email click-through information. The goal was to predict the likelihood of whether someone would or could be persuaded to vote for Obama—and whether he or she would vote.

Scoring individuals in these three areas helped determine how each individual would be addressed. For example, assessing people along two dimensions—support and turnout—yielded four groupings. Two groupings involved Mitt Romney supporters, only a few of whom considered potentially persuadable were contacted by Obama's campaign. Likely supporters who were not likely to vote were targeted by efforts encouraging them to go to the polls, which led the campaign to experiment with behavioral psychology techniques. Supporters who were likely to vote were tapped to serve as advocates and provided with tools to help persuade other voters.

Constant experimentation was performed throughout the campaign in tandem with analytics efforts. While analytics can be used to make informed predictions, campaigning is ultimately about getting people to go to the polls to vote for a particular candidate. Experimentation included changing how often emails were sent to determine the optimal contact frequency.

The data science team's innovative use of predictive analytics brought significant value to Obama's winning 2012 campaign. Future campaigns at the national, state, and even local levels will attempt to adopt and advance these strategies to make the most effective use of volunteers and every donor dollar and get supporters to the polls.

[7] Obama's Data Scientist: Metrics Didn't Win the Campaign, People Did," *Wired UK*, 6 November 2013

Session III

Mike Trick, operations research professor at Carnegie Mellon, partner with Sports Scheduling Group

Key points

- Today's readily available computational power has made analytics efforts that were all but impossible just 15 years ago a relatively simple prospect.
- Historical data related to individual markets can be mined to increase revenues.
- What can be controlled can be optimized.
- In complex systems with many interdependencies, "best possible" outcomes rather than "ideal" results have to suffice.

In 1995, former baseball executive Doug Bureman approached Mike Trick to discuss the possibility of optimizing the schedule for Major League Baseball (MLB), whose schedule includes more than 2,400 games over a six-month time period, during which each team plays an average of eight games every nine days.

For the next decade, Bureman, Trick, and their partners at Sports Scheduling Group (SSG) considered the challenge of optimizing the busiest schedule in sports by running tests and pilots. Slow software, slow computers, and 150 pages of scheduling constraints from MLB were among the obstacles they faced as they honed their system. Finally, SSG received the contract to generate MLB's schedule starting with the 2005 season.

SSG has brought significant value to MLB by optimizing the league's schedule so that it can continue to increase its annual revenues by an estimated $120 million across all 30 MLB teams. Essentially, each potential game date for a team has a value according to the day of the week and month. The schedule cannot account for certain uncontrollable variables, including an individual team's talent (winning teams tend to draw more fans to the park), player injuries, or weather—but what can be controlled can be optimized.

Historical data is used to identify trends for individual teams so that they can have more financially favorable home schedules. For example, Mondays and Thursdays are baseball's traditional "travel days," during which some teams have the day off. Some teams typically have higher attendance on one or both of these days; for others, there is no discernible difference. Thus, the schedule is drawn up accordingly. Similarly, some teams draw better during certain months, while others have more consistent attendance across the season. The schedule is adjusted to favor each team's busier months by giving them more or fewer home games in a given month.

Each team's schedule is optimized as well as possible, but interrelations among all 30 teams mean that teams have to settle for "best possible" rather than "ideal" schedules. SSG's work has led to the schedule becoming an important element of the MLB's profitability. The operational problems—the questions posed through the model—have proven more challenging to grapple with than the actual data analysis and schedule generation.

Roundtable Discussion

Key points

- Getting the right people together with the right technology poses a major challenge.
- Collaboration among those with different skillsets is crucial—alignment around clear goals can incent this collaboration.
- Executive sponsorship is essential.
- Because they were born from data, Internet businesses have a built-in advantage when it comes to employing it.
- Big data and analytics will continue to evolve, but they are here to stay.

The second day of the executive roundtable concluded with a wide-ranging exchange of views by all attendees. Among the points discussed were how to improve legacy organizations' ability to kick-start their analytics and big data efforts. Who should be performing experimental analytics work—specialized teams or hands-on practitioners from the business units? How can laggard industries such as healthcare catch up to industries such as retail, which is on the leading edge of analytics and big data work? Who can best champion analytics efforts? Can legacy companies catch up to those Internet businesses that were born with data-driven cultures?

Many medium and large organizations are struggling to apply advanced analytics to big data efforts. Relational databases can support advanced analytics by bringing data together in a manageable fashion, but many companies are not yet doing this.

While retailers, among others, are obtaining results through advanced analytics and universities are producing people who can perform data mining and other analytics work, getting the right people together with the right technology remains a significant hurdle. The technology is readily accessible; the challenges lie on the people side. Data scientists, IT engineers, and end-users all have discrete roles to play at present, as so few individuals have the full set of skills needed to shape questions, perform analyses, and work with the results. Yet these diverse parties must be able to communicate and work cooperatively to collaborate successfully on analytics efforts. Appropriate alignment around incentives is also vital to success. Important objectives must be communicated and accepted, and a clear pathway to success must be presented.

Companies that are new to or struggling with their analytics efforts may benefit from a more grassroots approach, as the people who have the best sense of what needs changing are often those closest to the work. A process is needed to enable all practitioners, and not just data scientists, to experiment with and develop prototypes that can be ramped up to achieve scale.

Too few organizations are actually operationalizing the insights from advanced analytics.[8] Analytics can bring significant value through the creation of new business opportunities and by reducing friction throughout the business and supply chain. Retailers are using analytics to ensure that delivery times, product pricing, and store layouts are perfectly planned and executed across the whole chain. Retailers continue to address the challenge of combining targeted customer marketing with pricing and advertising to optimize the sales process. A willingness to experiment and learn from failures is a must.

[8] For more, see *The CIO's Role in Operationalizing IT Innovation* at atkearney.com.

Healthcare companies tend to lag in their use of data. They need to start capitalizing on data to produce analyses, then interpret those analyses and find ways to integrate the lessons into their businesses to change for the better—for example, by improving care to reduce instances of hospitalization.

As demonstrated in the LEAP study and several presentations, executive sponsorship can be essential to succeeding in analytics efforts. But as important as senior leadership buy-in is, some have also found that a passionate individual who directly benefits from this work can also prove to be an ideal sponsor—for example, a leader from the marketing function. Accountability is a must, as are constant reminders regarding the big picture to build and maintain momentum.

Rayid Ghani, University of Chicago, talks about the role of analytics in the Obama campaign.

Internet businesses such as Amazon operate in a data-driven fashion from day one because their cultures developed around data and they can act in real time in ways that bricks-and-mortar stores simply cannot. For these new businesses, analytics are used throughout the entire selling and fulfillment process. A wide range of considerations must be weighed. Amazon engineers understand data-driven arguments, and the company's decentralized structure encourages grassroots development work. Similarly, eBay's data hub is open to all employees for their analytic work. Cultural change is a challenging proposition for those businesses that predate the e-business boom of the late 1990s.

Businesses continue to find innovative ways to gather data. One company uses aerial-mounted high-resolution thermal cameras to see how full oil companies' vessels and pipelines are and then sells that information. Others count traffic at standalone big-box retailers to get a sense of how busy individual stores are and estimate sales. Real-time data is especially powerful, as it opens up new ways to employ analytics.

Concluding Thoughts

Big data and analytic practices represent a new Industrial Revolution, and these areas will continue to evolve in exciting new ways.[9] This is a transformational moment for enterprises, as business analytics presents both opportunities and challenges. Traditional businesses such as AIG, Macy's, GE, and Major League Baseball are joining the likes of Amazon to reap the top- and bottom-line benefits of data. Doing this requires companies to accept that data and decision making can no longer reside in their own silos; data must inform decision making in order to unlock competitive advantage.

Successful enterprises will seize this opportunity by advancing their cultures to drive an enterprise-wide analytic operating model that puts data science at the center of their business strategy and management practices. Even as the CAO or chief data scientist role is just beginning to emerge, it is conceivable that this position will prove to be a waypoint in the journey toward a future in which the COO or CFO and their teams will be so analytics focused as to subsume these duties.

Transformation takes time; a long journey lies ahead for the business community. Those at the forefront will achieve the most significant results, while the followers and laggards will struggle and in some cases even collapse. The best thinking from operators, analytics practitioners, technology innovators, and the academic community will drive this change and the successes it will bring. A.T. Kearney will contribute to this journey by creating a sustainable community through the Beyond Big executive roundtables and related activities that bring people on this journey together to exchange ideas and shape the path forward.

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[9] See *The Science of Big Data*, an interview with Fermilab physicist Rob Roser, at www.atkearney.com.

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